Remote Sensing Workshop for Riparian Studies

November 1, 2006

Cooperative Monitoring, Evaluation, and Research (CMER)

State of Washington Forest Practices Board
Adaptive Management Program

Cooperative Monitoring Evaluation and Research

The Washington Forest Practices Board (FPB) has adopted an adaptive management program in concurrence with the Forests and Fish Report (FFR) and subsequent legislation. The purpose of this program is to:

> Provide science-based recommendations and technical information to assist the board in determining if and when it is necessary or advisable to adjust rules and guidance for aquatic resources to achieve resource goals and objectives. (Forest Practices Rules, WAC 222-12-045)

To provide the science needed to support adaptive management, the FPB made the Cooperative Monitoring, Evaluation and Research Committee (CMER) a participant in the program. The FPB empowered CMER to conduct research, effectiveness monitoring, and validation monitoring in accordance with guidelines recommended in the FFR

Additional information about the CMER program is available at:
http://www.dnr.wa.gov/forestpractices/adaptivemanagement/

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November 1, 2006
University of Washington Center for Urban Horticulture
Seattle, Washington

Need Statement

The Cooperative Monitoring Evaluation and Research (CMER) committee of the Washington Forest Practices Adaptive Management Program is responsible for conducting studies to evaluate the effectiveness of Forest and Fish Rules (FFR; WDNR 1999) including riparian buffer prescriptions to protect and maintain aquatic resources. The FFR buffer prescriptions vary widely depending on water type, channel size, geographic location, and forest type. Best available science was used to establish the buffer prescriptions, however there is uncertainty concerning the function, suitability, and effectiveness of the prescriptions given large natural variability across the landscape and the economic constraints of modern forest practices. To address the technical issues, CMER identified a suite of riparian stand and buffer effectiveness studies (CMER 2005). The studies range from landscape scale characterization of riparian stand conditions to intensive investigations of different buffer treatments. Some of the proposed studies are currently in progress and some are still being planned.

Riparian stand information needs vary among the studies depending on the question and spatial scale of the investigation. CMER has identified a range of methods to gather riparian stand information. Field surveys, aerial photography, and other remote sensing methods have been proposed. Given the large range in capability, suitability, and cost for the various survey tools, CMER recognized that professional guidance was needed to identify the most suitable methods for their investigations. CMER also recognized that aerial photography could provide useful information, but had questions about the appropriate scale, accuracy, and cost for implementing this methodology. To address these questions and related issues, CMER decided to fund a small project that compares the utility (i.e. accuracy, cost, and feasibility) of different resolutions of aerial photography as a resource for the collection of riparian vegetation monitoring data. In addition, CMER decided to host a workshop with remote sensing and forest inventory professionals to discuss the photo study results and to contribute their knowledge on the applicability of aerial photography and other remote sensing tools for the riparian study program.

Additional information about the CMER work plan is available at:
http://www.dnr.wa.gov/forestpractices/adaptivemanagement/

Focus

The overall purpose of the workshop is to obtain guidance from remote sensing and forest inventory professionals that will help CMER identify appropriate field and remote data collection methods for the riparian studies program. To achieve this goal, we are focusing the methods discussion on existing and proposed riparian stand studies. Attached is a table that summarizes key elements of these studies including a list of study variables and the proposed data collection methods. Given the information needs of these studies CMER seeks guidance to determine the best applicable data collection method or combination of methods.

Attributes that should be considered for evaluation of data collection methods.

A. Accuracy of feature identification
    - Tree standing, down, or snag
    - Tree species or taxonomic category
    - Tree decay class or condition
    - Mortality process (windthrow, disease, fire)
    - Stand composition
    - Stream channel edge or channel location

B. Accuracy of measuring feature dimensions
    - Tree size (height, diameter)
    - Down tree length or diameter
    - Tree location (distance to other trees/features or location category)
    - Riparian stand width and length (distance or size category)

C. Natural variability
    - Size of sample unit

D. Feasibility to Implement
    - Requires landowner access
    - Works in mountainous terrain
    - Survey timing and duration requirements

E. Cost
    - Number of sites
    - Travel time

CMER Riparian Studies Comparison (10/06/06)

Project Features		Riparian Ext. Monitoring *Proposed*	ES Current Conditions Phase I *On Going Pilot*	ES Current Conditions Phase II *Future*	BCIF *On Going*	Bull Trout Overlay *On Going*	Bull Trout Overlay Add-on *Proposed*	Type N Exp (amphibian) *Starting-Up*	Type N Exp (WQ) *Proposed*
Purpose		Status & Trend	Status	Effectiveness	Effectiveness	Effectiveness	Effectiveness	Effectiveness	Effectiveness
1st Order Question		What is current condition and future trend of riparian stands on FFR lands?	What are current characteristics and distribution of riparian stands on FFR lands?	Is Eastside FFR F-riparian classification system valid? If not what is?	Do riparian Rx's achieve FFR resource objectives and targets	Do the standard or BTO Rx's meet temperature standards?	What are effects of standard and BTO Rx's on resource objectives and functions?	What is effectiveness of alternative Rx's	What is effectiveness of alternative Rx's
2nd Order Questions		a) What proportion have FFR buffers? b) What proportion could meet DFC? c) What is the pattern of riparian stand age, composition and density on FFR lands and how is it changing over time?	a) What relationships exist between location and riparian stand characteristics? b) What is quantity and distribution of riparian mortality agents (e.g., windthrow, insect, disease?	a) Can existing ripanian conditions under FFR Rx's meet DFC? b) What proportion of riparian length could meet DFC? c) What alternative Rx could meet DFC?	a) What are effects over time of Rx's on riparian stands (mortality) and functions (shade, LWD recruitment, bank erosion)? b) Do Rx's affect potential DFC?	a) What are differencs between standard and BTO Rx's for providing shade, canopy cover, solar energy? b) How does densiometer measue of all-available-shade compare to solar energy input?	a) What are effects of Rx's on stand mortality and LWD recruitment? b) Does Rx's affect potential DFC? c) How do the Rx affect stand development and vulneability to disease, insect and fire hazard?	a) How does different buffer Rx's affect amphibian abundance and genetics? b) How does Rx's affect downstream WQ and fish habitat?	a) How does different buffer Rx's affect function (e.g.,sediment supply)? b) How does Rx's affect downstream WQ and fish habitat?
Scale		landscape	landscape	landscape	reach	reach	reach	N subbasin	N subbasin
Sample Population	F west	random all FFR	---	---	random FPAs	---	---	---	---
	N west	random all FFR	---	---	?	---	---	selected basalt	selected soft geo
	F east	random all FFR	random all FFR	stratified random sub.	?	selected FPAs	selected FPAs	---	---
	N east	random all FFR	---	---	?	---	---	---	selected hydology
Sample Unit		reach	transect	?	harvest unit	harvest unit	harvest unit	harvest unit	harvest unit
Exp. Design		repeat measures over time	compare and contrast ripanian conditions across landscape	compare modeled outcome of Rx options by strata	treat-reference comparison, post-harvest	before-after, control-impact comparison	before-after, control-impact comparison; model outcome of Rx's	before-after, control-impact comparison	before-after, control-impact comparison
Product		frequency distribution of stream miles by rip stand condition (e.g., shade, width, composition, density cat)	defined riparian strata and distribution of stand conditions by RMZ zones	probability of Rx's meeting DFC by riparian strata	duration and magnitude of change & performance of riparian functions	difference in riparian shade and solar energy input between Rx's	difference in mortality & riparian functions between Rx's, probable (modeled) future condition & potential of Rx's meeting DFC?	difference in riparian functions among Rx's	difference in riparian functions among Rx's
Variable Accuracy[a]	density	quan cat	measure	measure	measure	quan cat	measure	measure	quan cat
	composition	quan cat	measure	measure	measure	quan cat	measure	measure	quan cat
	size	desc cat	measure	measure	measure	quan cat	measure	measure	quan cat
	age	desc cat	desc cat	measure	quan cat	quan cat	quan cat	quan cat	quan cat
	mortality	quan cat	measure	quan cat	measure	quan cat	measure	measure	measure
	LWD recruits	NA	measure	quan cat	measure	quan cat	measure	measure	measure
	shade	quan cat	NA	quan cat	measure	measure	NA	measure	measure
	buffer width	quan cat	measure	quan cat	quan cat	quan cat	quan cat	quan cat	quan cat
Methodology		field or photo?	variable width strip plot	?	fixed area plot/ field census?	strip plot	field census?	field census?	?

[a]Variable Accuracy scales: descriptive categories (e.g., young-mature; **desc cat**), quantiative categories (e.g., 0-100, 100-200 tpa;**quan cat)**, or absolute counts and measures (**measure**).

Remote Sensing Workshop for Riparian Studies

Agenda

Time*	Topic	Presenter
9:00 am	Introduction	Doug Martin, Co-chair CMER
9:15 am	Suitability of aerial photography for riparian buffer monitoring	Richard A. Grotefendt, Grotefendt Photogrammetric Services, Inc
10:05 am	Forest information extraction from high spatial resolution images using an individual tree crown approach	Francois A. Gougeon, Canadian Forest Service, Natural Resources Canada
10:35 am	Break	
10:50 am	Connecting Lidar with color infared (CIR) and hyperspectral imaging for forest inventory	Jim Flewelling, Seattle Biometrics and Analysis, LLC
11:20 am	Discussion	Group
12:00 pm	Lunch	
1:15 pm	Map development of riparian landscapes using QuickBird satellite imagery	Sarah Gergel, Department of Forest Sciences and Centre for Applied Conservation Research, UBC
1:45 pm	Hyperspectral, multispectral, and lidar sensing and data fusion for forest habitats	L. Monika Moskal, College of Forest Resources, UW
2:15 pm	Break	
2:30 pm	Making sense of a bag of remote sensing tools	Ward Carson, Remote Sensing Consultant, Retired Oregon State University, PNW, University of Washington
3:00 pm	Integration of remote sensing data with management tools for decision making	Bob McGaughey, USDA Forest Service, Pacific Northwest Research Station
3:30 pm	Discussion	Group

*Time for questions is included during each presentation period

Presenters

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